

The Scientific Committee on Solar-Terrestrial Physics (SCOSTEP)

Annual Report (1 January – 31 December, 2016)

Prepared by Marianna G. Shepherd, SCOSTEP Scientific Secretary

The report that follows covers the period from 1 January to 31 December, 2016. It reflects the activities carried out by the organization and its current scientific program, “Variability of the Sun and Its Terrestrial Impact” (VarSITI). SCOSTEP through its Capacity Building and VarSITI programs supported 19 scientific conferences and workshops and further developed collaboration with the ISWI (International Space Weather Initiative) through the support of ISWI meetings and the International Space Science Schools. SCOSTEP participated in the 53th Scientific and Technical Subcommittee (STSC) of the UN COPUOS (Committee on the Peaceful Use of Outer Space) as a permanent observer. These events were communicated to the SCOSTEP scientific community via the SCOSTEP and VarSITI Newsletters and the results achieved are summarized in this report.

1. SCOSTEP SPONSORED SCIENTIFIC MEETINGS AND WORKSHOPS (in chronological order)

- SCOSTEP/COSPAR/ILWS 2016 “Science for Space Weather” Workshop, 24-29 January 2016, Goa, India

Understanding and being able to forecast space weather is increasingly important for our modern technology-reliant society. This workshop treated all aspects of space weather, from solar origin of transient events to their propagation through the heliosphere and effects on Earth and other planetary bodies, from particle energization to forecasting the particle environment and its effects on technological and biological systems, as well as solar-cycle effects and coupling of space weather to atmospheric response. 105 participants (incl. 25 students) from 21 countries contributed 35 invited and 22 contributed talks, 47 posters, and participated in a lively panel discussion. The final workshop program can be found on the workshop web pages: <http://www.cessi.in/ssw/>. The workshop also included a two-day school for MSc. and PhD. students which offered 15 overview talks and two hands-on tutorials on two afternoons.



Figure 1: Participants in the SCOSTEP/COSPAR/ISWI 2016 workshop, Goa, India

- The 3rd International Annual Conference of the Nigerian Geophysical Society

The 3rd Annual International Conference on Space-Earth Environment for National Sustainable Development organized by the Nigerian Geophysical Society was held at Landmark University, Omu-Aran, Kwara State, Nigeria during 2 – 5 February, 2016. Over 150 participants registered and participated in the 3rd conference, which include undergraduate and post-graduate students from 22 Higher Institutions of learning in Nigeria (Universities, Polytechnics and Colleges of Education). The meeting was successful with over 50 Oral Presentations covering almost all the areas of solar-terrestrial research. Support for the NGS conferences was provided by the Landmark University, by the SCOSTEP/VarSITI (Variability of the Sun and its Terrestrial Impact) program, National Space Research and Development Agency (NASRDA) and the Atmospheric and Space Environment Research Network (ASPERN).



Figure 2: Group photo of the participants in the 3rd NGS conference.

- “Solar activity in the following decades”, a ISSI/VarSITI Forum on future evolution of solar activity, 1-3 March 2016, ISSI, Bern, Switzerland

One of the main questions to be solved by the SEE/VarSITI project is: “For the next few decades, what can we expect in terms of extreme solar flares and storms, and also absence of activity?” A joint ISSI/SEE brainstorming meeting was held in Bern, during 1 – 3 March 2016, to assess the future evolution of solar activity. After 3 days of a very passionate discussion it was concluded that the next two solar cycles will not be intense with high solar activity, but will not lead to the beginning of a grand Maunder type minimum. It is most likely that solar cycle 25 will be of the same intensity as cycle 24, while the following one may be lower. There is some probability of a Dalton type minimum, which is inferred by the absence of the polar branch of “torsional oscillations” and hemispheric asymmetry in activity.



Figure 3: Group photo of the participants in the ISSI/VarSITI workshop.

- IAGA-IV Symposium on “Influence of short and long term solar variability on climate”, Hurghada, Egypt, 20-24 March 2016

This was the Symposium’s 4th installment, with 70 participants from nine countries: Cameroon, Egypt, UK, France, Germany, Mali, Morocco, Russia, and Saudi Arabia, who gave 49 presentations (<http://iaga.cu.edu.eg>), including 9 review/invited speakers' talks, 15 papers were oral contributions and 25 papers were presented as posters. The scientific program included 6 scientific sessions: Solar and Space missions for Space Weather and solar variability observations; Solar activity/variability effects on the lower, middle and upper atmosphere; Modeling climate consequences of solar activity influence and suggested mechanisms; Modeling and predicting large flares, super flares, CMEs and other extreme events; Solar energetic particles and Solar wind influence on the Earth's inner magnetosphere and atmosphere, and Societal impact of solar variability, Education. The articles issued from these presentations are to be published in a special issue of the Cairo University Journal of Advanced Research, an Elsevier publication.



Figure 4. Group photo of the participants taken outside the meeting hall in Hotel Golden-5, Hurghada, Red Sea.

- **Space Climate School and Space Climate Symposium 30 March - 7 April 2016, Levi, Finland**

The 2nd Space Climate School and the 6th Space Climate Symposium were organized during 30 March -7 April 2016 in Levi, Finnish Lapland, under the leadership of the ReSoLVE Centre of Excellence of the Academy of Finland. The School aimed at the training of PhD students and young researchers of solar-terrestrial sciences, and covered a unique selection of topics relevant for space climate studies, including several long-term datasets and various data analysis and statistical methods. Support for its activities was provided by the SCOSTEP capacity Building program. The school had also several hands-on computer exercise sessions, where students practiced to use different online databases and analysis methods. The School had 18 internationally recognized experts as lecturers, and 50 students of 20 nationalities from 4 continents, a truly international setting. The school also offered excellent possibilities for networking between students and lecturers.

The 6th Space Climate Symposium gathered 120 attendees of 35 nationalities to discuss the recent developments of space climate. The Symposium gave an extensive overview of a versatile selection of space climate topics, including solar dynamo, long-term solar activity, solar asymmetries, extreme events, solar corona and solar wind, the Earth's magnetosphere and ionosphere, as well as solar influence on climate. In total there were 58 talks and 56 posters. The program and presentations of the Space Climate School and Symposium are available at <http://www.spaceclimate.fi>



Figure 5: Group photo of participants.

- **3rd International ANTarctic Gravity Wave Instrument Network (ANGWIN) Science Workshop**

The 3rd ANGWIN science workshop was organized by the British Antarctic Survey and held in Cambridge during 12-14 April 2016. There were 33 delegates from 10 different countries. SCOSTEP/VarSITI was a co-sponsor of the meeting and its sponsorship contributed to the provision of partial funding for 8 early career scientists to attend the workshop. A range of topics covered by presentations at the workshop on modelling studies of gravity waves in the Polar Regions, observational results from all regions of the atmosphere and future instrumentation that will be deployed in 2017. Two discussion sessions were held where content for the new ANGWIN website (www.bas.ac.uk/projects/angwin) was discussed, future ANGWIN related publications planned and also future collaborative projects devised.



Figure 6: Group photo of the participants in the 3rd ANGWIN workshop.

- **JpGU2016 Space Weather, Space Climate and VarSITI session, 22-23 May, Makuhari, Japan**

JpGU2016 Space Weather, Space Climate, and VarSITI session was held on May 22-23 at Makuhari, Chiba, Japan. "Past, Present, and Future of Solar-Terrestrial Environment" was the keynote of this session. The latest scientific papers were presented on the understanding of how the solar-terrestrial environment changes in various time scales. The necessary international collaboration projects associated with VarSITI were also discussed. This session was in cooperation with the Project for Solar-Terrestrial Environment Prediction (PSTEP, PI: K. Kusano,

Nagoya University). Further, this is the first trial of JpGU and AGU joint-session, and Dr. Antti Pulkkinen (NASA/GSFC) was invited as AGU-counterpart convener, thanks to the travel support from the SCOSTEP/VarSITI fund. There were 33 talks and 32 posters, including the latest reports from PSTEP activities on Japanese space weather researches and operations, additional to NASA and NOAA activities.

- **The First VarSITI General Symposium, 6-10 June 2016, Albena, Bulgaria**

More than 100 scientists from 24 countries gathered in Albena, Bulgaria for the first VarSITI General Symposium (June 6-10, 2016), to overview the progress of various activities in the four VarSITI projects at the midpoint of the five-year SCOSTEP program. 114 oral and poster scientific papers were presented in the 7 symposium sessions: Solar and Heliospheric Drivers of Earth-Affecting Events; Long-term Variation of the Sun and Climate; Under-standing the Earth's space environment and its connection to space weather; Sun to Mud Campaign Study of March 15-17, 2015 Event and other significant events; Modeling the connection from Sun to Mud (and all steps in between); Data archiving; Special session on Heliospheric Cataloguing, Analysis and Technique Service (HELCATS). Some of the presentations are available online at <http://newserver.stil.bas.bg/VarSITI2016/>. A special issue of JASTP will be published with papers based on the Symposium presentations, with promotional access (free for the authors, 9 months free to download).



Figure 7: Group photo of the participants in VarSITI's 1st General Symposium, 6-10 June 2016, Albena, Bulgaria.

- **The 6th International HEPPA-SOLARIS Workshop**

The 6th International HEPPA-SOLARIS Workshop was held on 13-17 June, 2016, at the Finnish Meteorological Institute in Helsinki, Finland. The workshop continued the series of meetings organized since 2008 and focused on observational and modeling studies of the influences of solar radiation (SR) and energetic particle precipitation (EPP) on the atmosphere and climate. A total of 57 scientists participated from the following countries: Finland (14), USA (9), Germany (9), Norway (6), UK (5), Sweden (3), Greece (2), Spain (2), Switzerland (2), Czech Republic (1), Egypt (1), France (1), Japan (1), New Zealand (1). A total of 65 presentations were given: 7 invited oral, 35 oral, 23 posters. The workshop was scientifically and financially sponsored by VarSITI/SCOSTEP, IAMAS/IUGG, and SPARC. The workshop web pages at <http://heppa-solaris-2016.fmi.fi> provide more information.

- **6th Workshop on Vertical Coupling in the Atmosphere-Ionosphere System, Taipei, Taiwan, 25-29 July 2016**

To facilitate the community dialogue crucial to understanding how vertical coupling contributes to the overall variation of the Earth's atmospheric system, the 6th Workshop on Vertical Coupling in the Atmosphere-Ionosphere System was held at Academia Sinica in Taipei, Taiwan from July 25 to 29, 2016. This is the first time this Workshop has been held in East Asia, to encourage involvement of researchers in this region. Participation included colleagues from 16 institutions across 9 countries, with over 40 abstracts received. Topics of interest included upper and middle atmosphere variability induced by atmospheric tides, planetary waves. Ionospheric variations due to solar eclipses, dust storms, earthquakes, and increasing carbon dioxide concentrations were also discussed. A special edition of the Journal of Atmospheric and Solar-Terrestrial Physics was opened for submission in early November 2016, with a submission deadline of March 1, 2017. Abstracts and the Workshop program are available online at: <http://www.ss.ncu.edu.tw/~vcais6/program.html>.

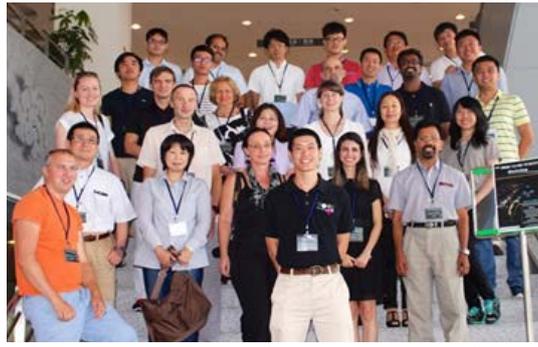


Figure 8: Group photo of participants in the 6th Workshop on Vertical Coupling in the Atmosphere-Ionosphere System, Taipei, Taiwan, 25 - 29 July 2016

- **International Symposium on Recent Observations and Simulations of the Sun-Earth System III, Golden Sands, Bulgaria, 11-16 September 2016**

The 3rd International Symposium on Recent Observations and Simulations of the Sun-Earth System (ISROSES-III) was held in Golden Sands, Bulgaria, from 11 to 16 September 2016. It created a forum for researchers from all space science communities worldwide to discuss the complex, multiscale, interactions in the Sun-Earth system. The Symposium covered a broad range of topics: a) interactions and coupling within the Sun-Earth system, b) advances in measurement, data analysis, theory, and simulations of the Sun-Earth system, c) reaction of the Earth system to the Sun and the solar wind, and d) recent research in space weather science and applications. The ISROSES-III scientific program consisted of oral and poster sessions which gathered about 100 participants for fruitful discussions. Among the ISROSES-III participants were distinguished speakers from the US, European Union, Canada, China, Japan, Norway, Russia, and other countries. For further information about the symposium, please visit the official website: <http://www.isroses.lanl.gov/>



Figure 9: Group photo of some of the participants in ISROSES-III

- **International Symposium on the Whole Atmosphere (ISWA), Tokyo, Japan, 14-16 September 2016**

The International Symposium on the Whole Atmosphere (ISWA) was organized by the School of Science, the University of Tokyo and the National Institute of Polar Research, and held at Ito Hall of the University of Tokyo on 14 - 16 September 2016. A total of 118 scientists and students from 14 countries participated in the symposium and reported their latest research regarding the whole atmosphere, particularly focusing on the dynamics of the middle and upper atmosphere. Research topics covered in this symposium include vertical and intra/interhemispheric coupling, atmospheric waves such as Rossby waves, gravity waves and tides, wave-mean flow interaction, solar effects, observation technology, and high-resolution modeling. A side meeting concerning the Interhemispheric Coupling Study by Observations and Modeling (ICSOM; <http://pansy.eps.s.utokyo.ac.jp/icsom/>) was also held during the symposium, in which a preliminary result of the first ICSOM campaign performed in January-February 2016 was reported. It was also confirmed that the next ICSOM campaign would be conducted in January - February 2017. Some of the presentations are available online at the ISWA website (<http://pansy.eps.s.u-tokyo.ac.jp/iswa/>). The SCOSTEP/VarSITI program was a cosponsor of the symposium and its sponsorship contributed to the partial support for 5 early career scientists to attend the meeting.

- **9th IAGA - ICMA/IAMAS - ROSMIC/VarSITI/SCOSTEP workshop on 'Long-Term Changes and Trends in the Atmosphere', IAP, Kühlungsborn, Germany, 19-23 September 2016**

The well-established biannual workshop on 'Long- Term Changes and Trends in the Atmosphere' took place from 19 to 23 September 2016 at the Leibniz Institute of Atmospheric Physics (IAP) in Kühlungsborn, Germany. The most important topics covered during the workshop were: Observed trends and long term

variations in the middle atmosphere; Modeled and predicted trends and long term variations in the middle atmosphere; Trends and long-term changes in the ionosphere and thermosphere; Dynamic, physical, chemical and radiative mechanisms of trends and long term variations; Role of the middle atmosphere for climate, and Trends in the entire atmosphere being relevant for the German research project ROMIC (Role Of the Middle Atmosphere In Climate). A total of 104 scientists and students from 16 countries participated in this workshop. This is the largest attendance since 1999, when this workshop first started. The workshop was also organized as a ROMIC symposium to present and discuss results from this German program within an international community. A total of 74 oral talks and 17 posters highlighted the actual status and recent progress in our understanding of trends and long term variations, e. g. by solar variability, from the Earth's surface to the upper thermosphere. Anthropogenic effects as well as variations due to the eleven year solar cycle and other sources of natural variability were discussed. Both measurements of various atmospheric parameters and results from different models were presented. The workshop was co-sponsored by IAGA, ICMA/IAMAS, the VarSITI/SCOSTEP program, the German Space Agency (DLR), the IAP institute, and the German ROMIC research initiative of BMBF.

- **7th VLF/ELF Remote Sensing of Ionospheres and Magnetospheres Workshop, Hermanus, South Africa, 19-24 September 2016**

The 7th workshop of the URSI/IAGA Joint Working Group on ELF/VLF Remote Sensing of Ionospheres and Magnetospheres (VERSIM) took place in Hermanus, South Africa, over the period 19-24 September 2016. The workshop attracted 55 participants from 16 countries and, in large part due to support from SCOSTEP/VarSITI, was able to support 11 individuals who were either young scientists (5), or came from developing countries (6). There were 69 abstracts received, 59 of which could be accommodated as orals presentations, and 10 as posters. More information on presenters and abstracts can be found on the abstract webpage: <https://events.sansa.org.za/abstracts>. The abstracts were organized into 6 days, the first 4 days of which were devoted to core VERSIM topics (including D-region, lightning, whistlers, plasmasphere, chorus and EMIC waves) and the last 2 days transitioned into more of a radiation-belt focus. The VERSIM scientific program can be found here: <https://events.sansa.org.za/versim-programme>.



Figure 10: The VERSIM workshop attendees, on the entrance steps of the South African National Space Agency (SANSA), September 21, 2016.

- **XIVth Hvar Astrophysical Colloquium "Solar and Solar-Terrestrial Physics: Now and in the Future", Hvar, Croatia, 26-30 September, 2016**

The Hvar Astrophysical Colloquium series of conferences is organized every 2 years and represents the most important solar physics event in Croatia, due to the aim of bringing together researchers from Europe and beyond which are active in the theoretical and observational study of all solar phenomena. The 14th Hvar Astrophysical Colloquium "Solar and Solar-Terrestrial Physics: Now and in the Future" was held on 26-30 September 2016 in Hvar, Croatia and covered a broad range of topics: 1) activity of the Sun and solar-like stars, 2) eruptive processes in the solar atmosphere, 3) solar terrestrial connection and the heliosphere, 4) space weather and space climate forecasting, and 5) observing techniques campaigns and databases. The meeting was attended by 75 scientists from 17 countries, with 10 invited, 60 contributed talks and 14 posters.



Figure 11: Group photo of the participants in the 14th Hvar Astrophysical Colloquium, 26-30 September 2016, Hvar, Croatia

- **IAU Symposium 327: Fine Scale Structure and Dynamics of the Solar Atmosphere, Cartagena de Indias, Colombia, 9-14 October 2016**

IAU Symposium 327 entitled “Fine Structure and Dynamics of the Solar Atmosphere” was the first IAU symposium held in Colombia and took place immediately after the XV Latin American Regional IAU Meeting (LARIM, 2-7 October 2016) and the First Workshop on “Astronomy Beyond the Common Senses for Accessibility and Inclusion” (8 October 2016). The venue was the University of Cartagena, in Cartagena de Indias. The main scientific goal of this symposium was to discuss recent results on the processes shaping the structure of the solar atmosphere and driving plasma eruptions and explosive events. This symposium brought together researchers, in both theory and observation. A total of 76 scientists and students from 19 countries participated in the IAUS327. The SCOSTEP/VarSITI program was a co-sponsor of the symposium and partially supported the participation of students.

- **SCOSTEP/ISWI International School on Space Science, November 7 – 17, 2016, Sangli, Maharashtra, India**

The SCOSTEP/ISWI International School on Space Science held in Sangli, India, was one of the recent Space Science schools organized jointly by the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) and the International Space Weather Initiative (ISWI). The target audience was graduate students who are pursuing PhD in solar-terrestrial physics and space science. The school directors were: Dr. Nat Gopalswamy (NASA/GSFC, USA), Dr. P. K. Manoharan (Radio Astronomy Center, Ooty, India), Dr. Dipankar Banerjee (Indian Institute of Astrophysics, Bengaluru, India), Dr. Dadaso Shetti (Smt. Kasturbai Walchand College, Sangli, India). There were 28 lectures by 23 Professors from USA, Japan, India, and Norway. A ISWI Instruments workshop was conducted by 8 scientists from USA, India, Japan, and Switzerland. From the 120 applications 74 graduate students were selected from China, Egypt, Ethiopia, India, Indonesia, Ivory Coast, Kenya, Korea, Nigeria, Philippines, Rwanda, Thailand, Uganda, and Vietnam.



Figure 12: The school participants with the Maharaja of Kolhapur, H. H. Shahu II Chhatrapati (center in white) during a field trip on November 13, 2016.

As a part of the outreach program lecturers from the SS school (M. Guhathakurta, M. Kirk, M. Miesch, and S. Kanekal) interacted with high school students from A. B. Patil High School, while the SS School Directors, N. Gopalswamy, P. K. Manoharan, and lecturers, K. Groves and N. Ostgaard participated in a question-answer session with about 100 science students from local high schools. The Space Science School was supported by the SCOSTEP Capacity Building program.

- **ISEE Workshop on Ionospheric plasma bubble seeding and development, 29 November - 2 December 2016**

During the period from November 29 to December 2, 2016, “Workshop on Ionospheric plasma bubble seeding and development” was held at the Institute for Space and Earth Environment Research (ISEE), Nagoya University, Nagoya, Japan. It was supported by the ISEE program “Project for Solar-Terrestrial Environment Prediction (PSTEP)”. The main purpose of the meeting was to review the current scientific understanding in the Equatorial plasma bubbles (EPBs) and to outline next steps in this research. 23 participants from 8 countries joined the meeting and discussed topics of observation and interpretation, new measurements and simulation models. Through the round table discussions participants pointed out the importance of coordinated ionospheric observations along the geomagnetic equator and the modelling of plasma bubbles using more realistic global atmospheric model. The workshop program and abstracts are available at http://stdb2.stelab.nagoya-u.ac.jp/2016_bubble_ws/.



Figure 13: Group photo of the participants in the ISEE workshop

2. SCOSTEP TOWN HALL MEETING ON FUTURE SCIENTIFIC DIRECTIONS – 12 December 2016, San Francisco

In 2016 SCOSTEP initiated an effort to develop community consensus in defining its future activities based on surveys of (i) current status of knowledge, (ii) key knowledge gaps in our understanding and observing capability of solar and terrestrial phenomena and processes, (iii) future directions in observations and modeling to fill these gaps. The objective is, at the end of these consultations and discussions, to put forward a plan that will lead to discoveries and support the solar-terrestrial physics community and elevate its societal relevance.

SCOSTEP solicited input from the community on the key issues that need to be addressed in making progress in solar terrestrial physics. The ultimate goal of the white paper is to identify and emphasize key science questions relevant to the entire SCOSTEP community instead of focusing on the study of individual phenomena. While we need to be aware of what is being done in the solar-terrestrial community at large one of the main purposes of this solicitation is to identify a niche for SCOSTEP’s community to make a unique contribution to the solar-terrestrial physics research with high scientific and societal relevance. It is recognized that taking ‘ownership’ of a specific niche would magnify the impact of SCOSTEP’s activities in the international solar-terrestrial physics community.

On December 12, 2016 a Town Hall meeting was held in San Francisco during the Fall AGU meeting where the future directions in solar-terrestrial physics research were discussed by a panel of scientists including: Janet Luhmann (*Senior Fellow at the Space Sciences Laboratory, University of California, Berkeley*); Sarah Gibson (*Long-term Solar Variability (LSV) Section Head, HAO/NCAR*); Jacob Bortnik (*UCLA, Incoming Chair of NSF/Geospace Environment Modeling (GEM) program (2017-2019)*); Jie Zhang (*Professor of Solar Physics, Department of Physics and Astronomy, George Mason University*); Kazuo Shiokawa (*VarSITI Co-Chair, Center for International Collaborative Research (CICR) Institute for Space-Earth Environmental Research (ISEE) Nagoya University*), and Daniel Marsh (*Atmospheric Chemistry Observations and Modeling, National Center for Atmospheric Research*). The panel discussion was chaired by SCOSTEP’s President, Nat Gopalswamy. Input from the STP community was also received. All ideas and suggestions were incorporated into a draft document to be distributed and further discussed.

3. SCOSTEP BUREAU MEETINGS

SCOSTEP organizes and conducts international solar-terrestrial physics (STP) programs of finite duration in cooperation with other International Council for Science (ICSU) bodies. Results from these programs are shared with the community of SCOSTEP scientists by joining in conducting meetings, conferences, and workshops and by publishing newsletters, handbooks and special journal issues.

The relevant ICSU bodies are represented in SCOSTEP by the Bureau members (IAU, IAGA, IAMAS, IUPAP, COSPAR, URSI, and SCAR).

3.1. SCOSTEP Bureau Meetings

The SCOSTEP Bureau held its annual meeting on April 25, 2016 at York University, in Toronto, Canada. Minutes from the meetings can be found on the SCOSTEP Website. The minutes from the meeting could be found on the SCOSTEP Website.

4. SCOSTEP AWARDS – DISTINGUISHED SCIENCE AND YOUNG SCIENTIST AWARDS

The Awards Selection Committee is led by Prof. Archana Bhattacharyya (India – Chair) with Committee members: Vladimir Kuznetsov (Russia - Deputy Chair and Liaison to the Bureau), Mark Miesch (USA), Andras Ludmany (Hungary), and Marco Milla (Peru). Six awards have been given since 2013, to honor outstanding service (2) and scientific achievement in solar-terrestrial physics (two general and two young scientist awards).

In 2016 the second installment of the SCOSTEP Distinguished Science and Young Scientists Awards was presented to the following scientists:

The *Distinguished Science Award* for 2016 was given to:

- **Prof. Sami Khan Solanki**, Director of the Max Plank Institute for Solar System Research, Germany for his profound contributions to all aspects of the influence of solar variability on Earth's climate, including development of physics-based irradiance models, which provide a basis for understanding the spectral solar irradiance variability, as well as to the broader understanding of solar magnetism.

The *Distinguished Young Scientist (DYS) Award* for 2016 was given to:

- **Dr. Nicholas Pedatella**, University Corporation for Atmospheric Research (UCAR), USA, for his work on atmospheric variability and data assimilation and ground-breaking contributions to the understanding of the influence of lower atmospheric waves on the spatial and temporal variability of the mesosphere, ionosphere, and thermosphere.
- **Dr. Brett Carter**, Space Research Centre, RMIT University, Melbourne, Australia, for his innovative approach in the study of the occurrence of equatorial plasma bubbles (EPBs) and of geomagnetically induced currents (GICs) producing results of considerable importance for the understanding of the origin and manifestation of these phenomena.
- **Dr. Xin Cheng**, School of Astronomy and Space Science in Nanjing University, China – DYS Honorable Mention Award - for conducting original research on the origin and evolution of coronal mass ejections (CMEs), the key component of the solar-terrestrial relationship.



Figure 14: The SCOSTEP Distinguished Science and Young Scientist Award Recipients for 2016, with SCOSTEP's President and Vice President (from left to right): Prof. Franz-Josef Lübken, Dr. Nicholas Pedatella, Prof. Sami Solanki, Dr. Bret Carther, and Dr. Nat Gopalswamy – Award Ceremony, June 10, 2016, Albena, Bulgaria.

5. CAPACITY BUILDING ACTIVITIES

SCOSTEP is actively involved in the advancement of Capacity Building and scientific excellence through its scientific programs and partnership with the ISWI, ICSU and URSI. Through its initiatives, e.g. Space Science Schools, SCOSTEP Visiting Fellowships (SVS), SCOSTEP facilitates the training, interaction and collaboration of young and early career scientists with the best of the STP scientific community.

- **Solar-Terrestrial Physics Symposia (STP):** Every 4 years - assess progress made by the scientific program. The 14th Quadrennial Solar-Terrestrial Physics Symposium (STP14) – July 9 – 13, 2018, Vancouver, Canada
- **SCOSTEP Visiting Scholar (SVS) Program:** Initiated in 2014, to support training visits by graduate students or young scientists from developing countries to an advanced laboratory (up to 3 months) – 10 recipients of the SVS
- **International Space Science Schools:** Every year to provide advanced training to PhD students and Post-Doctoral Fellows in collaboration with the International Space Weather Initiative (ISWI), International Council for Science (ICSU), and International Union of Radio Science (URSI).

SCOSTEP has partnered with the ISWI in capacity building and science education (CBASE) activities in Asia, Africa, and South America in collaboration with the URSI and ICSU regional offices for Asia and the Pacific (ICSU/ROAP), Africa (ICSU/ROA), and Latin America and the Caribbean (ICSU/ROLAC).

The CBASE activities consist of three elements:

- conducting advanced schools in Space Weather/Space Science for young people (scientists and graduate students)
- organizing teacher workshops for the benefit of school teachers in the host country
- conducting space instrumentation workshops to disseminate information on low-cost instruments that can be deployed in developing countries to gather valuable data on space weather from ground.

SCOSTEP and ISWI activities promote space Sun-Earth connection studies via complementary approaches in international scientific collaborations, capacity building, and public outreach.

5.1. SCOSTEP Visiting Scholar Program

- Objectives:
 - To provide training to young scientists and graduate students from developing countries in well-established solar-terrestrial physics (STP) laboratories
 - Aims to fund 4 scholars each year, one related to each of the four SCOSTEP/VarSITI themes (<http://www.varsiti.org>).
 - The training will help the young scientists to advance their career in solar-terrestrial physics using the techniques/skills they acquire during the training.
 - SCOSTEP provides the airfare; the hosting laboratory provides the living expenses
- Duration of tenure: 1 to 3 months
- All applications and inquiries – SCOSTEP Secretariat
- Further information – <http://www.yorku.ca/scostep/>

In 2016 nine applications were submitted. The SVS Selection Committee selected the following four candidates:



SUMOD, S.G., Mahatma Gandhi University, India (ISEE, Nagoya Univ.)



SASIKUMMAR RAJA, K., Indian Institute of Science Education and Research, India (NAOC, China)



GOKANI, Sneha, Indian Institute of Geomagnetism, India (SANSA)



BOLAGI, Olawale Segun, Univ. of Lagos, Nigeria (Univ. of Science & Technology, China)

6. SCOSTEP at STSC UN COPUOS, Vienna

The President of SCOSTEP, Dr. Nat Gopalswamy attended the 53rd Session of the STSC UN COPUOS and on February 17, 2016 made a technical presentation on SCOSTEP activities. The Presentation can be found on the SCOSTEP website.

7. SCOSTEP STP14, Vancouver 2018

Preparations are underway for the upcoming SCOSTEP 14th Quadrennial Solar-Terrestrial Physics Symposium, July 9 – 13, 2018 which will be held at the University of British Columbia, Vancouver, Canada. The

STP14 to be held in 2018 will be of great importance for the entire STP community, as it will feature the achievements of SCOSTEP's Variability of the Sun and Its Terrestrial Impact (VarSITI) program, which is to end in 2018.

8. SCOSTEP SECRETARIAT ACTIVITIES

In March 2016 the 5-year Grant-in-aid provided by the Canadian Space Agency in support of the SCOSTEP Secretariat expired. In April 2016 SCOSTEP granted a 3-year 'Grant-in-aid' to York University for the continued support of the SCOSTEP Secretariat, at the level of 20% of the Scientific Secretary's time. The SCOSTEP Grant is gratefully acknowledged.

The SCOSTEP Secretariat continued its work in coordinating and managing all SCOSTEP related activities, as well as providing logistic and technical support for the VarSITI program. The Scientific Secretary Prof. M. Shepherd organized the annual SCOSTEP Bureau meeting held on April 25, 2016 at York University in Toronto, Canada. M. Shepherd participated in the organization of the VarSITI 1st General Symposium and the discussions with the STP14 Organizing Committee. Dr. Shepherd organized the SCOSTEP Town Hall meeting on 'Future Directions in Solar-Terrestrial Physics', held on December 12, 2016 in San Francisco, during the AGU Fall meeting. Contributions from the STP community were solicited and together with the presentations by the Town Hall Panelists were summarized for further discussion by the SCOSTEP Bureau and the SCOSTEP community at large.

The Scientific Secretary also managed the SCOSTEP Visiting Scholar program, oversaw the announcements and all SVS applications, as well as the logistics associated with the administration of the SVS grants. The Scientific Secretary organized the nominations and selection of the recipients of the SCOSTEP Distinguished Science and Distinguished Young Scientist Awards, all logistics related to the preparation and presentation of the awards, issued SCOSTEP Newsletters, administered the SCOSTEP Website, administered the SCOSTEP finances and looked after general day-to-day SCOSTEP business. Further information on the activities outlined in this report could be provided on requested by the SCOSTEP Secretariat (mshepher@yorku.ca), or can be found at the SCOSTEP Website, <http://www.yorku.ca/scostep/>.